

CLAIMS

What is claimed is:

1. A yieldable cushioning element that includes foam, the cushioning element comprising:

foam formed to have a top, a bottom, and an outer periphery, said foam being compressible so that it will deform under the compressive force of a cushioned object,

a plurality of buckling members formed in said foam, each of said buckling members having a longitudinal axis along its length, and each of said buckling members having two ends;

wherein the cushioning element is adapted to have a cushioned object placed in contact with said top;

wherein each of said buckling member ends is positioned at two different points of said buckling member axis;

wherein at least one of said buckling members is positioned within said foam such that said buckling member axis is positioned generally parallel to the direction of a compressive force exerted on the cushioning element by a cushioned object in contact with said foam; and

wherein at least one of said buckling members is capable of buckling beneath a protuberance that is located on the cushioned object.

2. A yieldable cushioning element as recited in claim 1, wherein at least one other of said buckling members is positioned such that said buckling member axis is not parallel to the direction of a compressive force exerted on the cushioning element by the cushioned object in contact with said foam.

3. A yieldable cushioning element as recited in claim 1, wherein said foam is open-cell polyurethane.
4. A yieldable cushioning element as recited in claim 1, wherein said foam has an ILD of about 50 and a density of about 2.8 pounds per square inch.
5. A yieldable cushioning element as recited in claim 1, wherein a cross section of one of said buckling members taken orthogonal to said longitudinal axis of said buckling member has a shape selected from the group consisting of triangular, square, rectangular, pentagonal, heptagonal, octagonal, round, oval, and n-sided polygonal where n is an integer.
6. A yieldable cushioning element as recited in claim 1, wherein said foam has shape memory so that when a cushioned object is removed from contact with the foam, the foam has a tendency to return to a shape that approximates the shape of the cushioning element before the cushioning element and the cushioned object came into contact with each other.
7. A yieldable cushioning element as recited in claim 1, wherein at least one of said buckling members has a greater measurement orthogonal to said buckling member axis at a first point on said buckling member axis than at a second point on said buckling member axis.

8. A yieldable cushioning element as recited in claim 1, wherein at least one of said buckling members is tapered between the first of said buckling member ends and the second of said buckling member ends.

9. A yieldable cushioning element as recited in claim 1, wherein at least one of said buckling members is stepped between the first of said buckling member ends and the second of said buckling member ends.

10. A cushioning element as recited in claim 1, wherein at least one of said buckling members has a firmness protrusion located at one of said buckling member ends, said firmness protrusion being adapted to provide support within said buckling member when said buckling member buckles under a compressive force so that the cushioning element can readily yield in the vicinity of said buckling member under a cushioned object until the cushioned object begins to compress said firmness protrusion, whereupon said firmness protrusion retards further movement of the cushioned object into the cushioning element.

11. A yieldable cushioning element as recited in claim 1, and further comprising a cover.

12. A method for making a yieldable cushioning element comprising the steps of:

obtaining a bun of foam that has a length, a width, a height, a first face defined by the surface area of said length and said height dimensions, and a second face defined by the surface area of said width and said height dimensions,

making first cuts along said length upon said first face completely through said width, making second cuts along said length upon said first face completely through said width, where the order of said cuts from a top of said height to a bottom of said height starts with said second cut near said top, then said first cut, then said second cut, repeating until reaching said bottom where the last cut before said bottom is a said second cut, and where said first cuts and said second cuts are evenly spaced from said top to said bottom,

where the distance between said top and said first cut most proximal to said top is a first cut spacing, the distance between the interior said first cuts is equal to said first cut spacing, the distance between said bottom and said first cut most proximal to said bottom is equal to said first cut spacing,

making third cuts centered on said second cuts where said third cuts extend for a portion of said height less than said first cut spacing, for a portion of said length, and through said width, where said third cuts form a closed geometric shape on said first face and are repeated along said length, and

making fourth cuts on said second face through said length, centered on said second cuts where said fourth cuts have similar dimensions to said third cuts but form a closed geometric shape on said second face and are repeated along said width, and

separating said foam along said first cuts revealing cushion segments, separating said cushion segments along said second cuts revealing top half cushion segments, bottom half cushion segments and half buckling members created by said third cuts and said fourth cuts, removing disconnected pieces of foam, and

applying adhesive to exposed ends of said half buckling members, aligning and contacting said exposed ends of said half buckling members of said top half cushion segments with said exposed ends of said half buckling members of said bottom half cushion segments.

13. A method for making a yieldable cushioning element comprising the steps of:

obtaining a bun of foam that has a length, a width, a height, a first face defined by the surface area of said length and said height dimensions, and a second face defined by the surface area of said width and said height dimensions,

making first cuts on said first face along said length and through said width where said first cuts are evenly spaced from a top of said height to a bottom of said height,

making second cuts on said first face where there is one said second cut between said top and the said first cut most proximal to said top, where there is one said second cut between each interior said first cuts, and where there is one said second cut between said bottom and the said first cut most proximal to said bottom, where said second cuts run along said length and through said width,

where said second cuts create a repeating pattern comprised of n interlocking units, where the repeating pattern is comprised of a first interlocking unit oriented one direction between said top and said bottom and one dimension of said first interlocking unit is parallel with the axis through said height from said top to said bottom, a second interlocking unit contiguous with said first interlocking unit that is similar to said first interlocking unit but oriented 180 degrees opposed to said first interlocking unit, a third interlocking unit contiguous with said second interlocking unit that is similar to said second interlocking unit but oriented 180 degrees opposed to said second interlocking unit and 0 degrees opposed to said first interlocking unit, and where said repeating pattern repeats through n interlocking units with all odd numbered interlocking units oriented in the direction of said first interlocking unit and all even numbered interlocking units oriented in the direction of said second interlocking unit, and

separating foam along said first cuts revealing cushion segments, separating cushion segments along said second cut revealing top half cushion segments, bottom half cushion segments and half buckling members created by said second cuts, removing disconnected pieces of foam, applying adhesive to exposed ends of said half

buckling members, and aligning and contacting said exposed ends of half buckling members.

14. A method for making a yieldable cushioning element comprising the steps of:

obtaining a bun of foam that has a length, a width, a height, a first face defined by the surface area of said length and said height dimensions, and a second face defined by the surface area of said width and said height dimensions,

making first cuts along said length upon said first face completely through said width, making second cuts along said length upon said first face completely through said width, where the order of said cuts from a top of said height to a bottom of said height starts with said second cut near said top, then said first cut, then said second cut, repeating until reaching said bottom where the last cut before said bottom is a said second cut, and where said first cuts and said second cuts are evenly spaced from said top to said bottom,

where the distance between said top and said first cut most proximal to said top is a first cut spacing, the distance between the interior said first cuts is equal to said first cut spacing, the distance between said bottom and said first cut most proximal to said bottom is equal to said first cut spacing,

making third cuts centered on said second cuts where said third cuts extend for a portion of said height less than said first cut spacing, for a portion of said, and through said width, where said third cuts form a closed geometric shape on said first face and are repeated along said length,

making fourth cuts on said second face through said length, centered on said second cuts where said fourth cuts have similar dimensions to said third cuts but form a closed geometric shape on said second face and are repeated along said width,

separating foam along said first cuts revealing cushion segments, separating said cushion segments along said second cuts revealing top half cushion segments and

bottom half cushion segments and half buckling members created by said third cuts and said fourth cuts, removing disconnected pieces of foam, and

applying adhesive to exposed ends of said half buckling members, aligning and contacting said exposed ends of said half buckling members of said top half cushion segments with said exposed ends of said half buckling members of said bottom half cushion segments.

15. A method as recited in claim 14, wherein at least one other of said buckling members is positioned within said foam such that it is not parallel to the direction of a compressive force exerted on the cushioning element by a cushioned object in contact with said foam.

16. A method as recited in claim 14, wherein said foam is open-cell polyethylene based polyurethane.

17. A method as recited in claim 14, wherein said foam has an ILD of about 50 and a density of about 2.8 pounds per square inch.

18. A method as recited in claim 14, wherein said foam has shape memory so that when a cushioned object is removed from contact with the foam, the foam has a tendency to return to a shape that approximates the shape of the cushioning element before the cushioning element and the cushioned object came into contact with each other.

19. A method as recited in claim 14 where said third cuts and said fourth cuts form rectangular patterns on said first face and said second face respectively.

20. A method as recited in claim 14, wherein at least one of said buckling members has a firmness protrusion located at one of said buckling member ends, said firmness protrusion being adapted to provide support within said buckling member when said buckling member buckles under a compressive force so that the cushioning element can readily yield in the vicinity of said buckling member under a cushioned object until the cushioned object begins to compress said firmness protrusion, whereupon said firmness protrusion retards further movement of the cushioned object into the cushioning element.

21. A method as recited in claim 14, wherein said bun of foam has a height of at least 30 inches, and a length of at least 80 inches and a width of at least 60 inches.

22. A method as recited in claim 14, wherein said first cuts, said second cuts, said third cuts and said fourth cuts are made with a CNC reciprocal saw.

23. A method as recited in claim 14, wherein said third cuts are evenly spaced along said length, and said fourth cuts are evenly spaced along said width.

24. A method as recited in claim 14, and further comprising forming a cover on said cushion.

25. A method for making a yieldable cushioning element having buckling members, the method comprising the steps of:

obtaining a bun of foam that has a length, a width, a height, a first face defined by the surface area of said length and said height dimensions, and a second face defined by the surface area of said width and said height dimensions,

making first cuts on said first face along said length and through said width where said first cuts are evenly spaced from a top of said height to a bottom of said height,

making second cuts on said first face where there is one said second cut between said top and the said first cut most proximal to said top, where there is one said second cut between each interior said first cuts, and where there is one said second cut between said bottom and the said first cut most proximal to said bottom, where said second cuts run along said length and through said width,

where said second cuts create a repeating pattern comprised of n interlocking units, where the repeating pattern is comprised of a first interlocking unit oriented one direction between said top and said bottom and one dimension of said first interlocking unit is parallel with the axis through said height from said top to said bottom, a second interlocking unit contiguous with said first interlocking unit that is similar to said first interlocking unit but oriented 180 degrees opposed to said first interlocking unit, a third interlocking unit contiguous with said second interlocking unit that is similar to said second interlocking unit but oriented 180 degrees opposed to said second interlocking unit and 0 degrees opposed to said first interlocking unit, and where said repeating pattern repeats through n interlocking units with all odd numbered interlocking units oriented in the direction of said first interlocking unit and all even numbered interlocking units oriented in the direction of said second interlocking unit, and

separating said foam along said first cuts revealing cushion segments, separating cushion segments along said second cuts revealing top half cushion segments, bottom half cushion segments and half buckling members created by said second cuts, removing disconnected pieces of foam, applying adhesive to exposed

ends of said half buckling members, and aligning and contacting said exposed ends of half buckling members.

26. A method for making a yieldable cushioning element as recited in claim 25, wherein at least one other of said buckling members is not parallel to the direction of a compressive force exerted on the cushioning element by a cushioned object in contact with said foam.

27. A method for making yieldable cushioning element as recited in claim 25, wherein said foam is open-cell polyethylene based polyurethane.

28. A method for making a yieldable cushioning element as recited in claim 25, wherein said foam has an ILD of 50 and a density of 2.8 pounds per square inch.

29. A method for making a yieldable cushioning element as recited in claim 25, wherein said foam has shape memory so that when a cushioned object is removed from contact with the foam, the foam has a tendency to return to a shape that approximates the shape of the cushioning element before the cushioning element and the cushioned object came into contact with each other.

30. A method for making a yieldable cushioning element as recited in claim 25 where said third cuts and said fourth cuts form rectangular patterns on said first face and said second face respectively.

31. A method for making a cushioning element as recited in claim 25, wherein at least one of said buckling members has a firmness protrusion located at one of said buckling member ends, said firmness protrusion being adapted to provide support within said buckling member when said buckling member buckles under a compressive force so that the cushioning element can readily yield in the vicinity of said buckling member under a cushioned object until the cushioned object begins to compress said firmness protrusion, whereupon said firmness protrusion retards further movement of the cushioned object into the cushioning element.

32. A method for making a yieldable cushioning element as recited in claim 25, wherein said bun of foam has dimensions of said height equal to 30 inches, said length equal to 80 inches and said width equal to 60 inches.

33. A method for making a yieldable cushioning element as recited in claim 25, wherein said first cuts and said second cuts are made with a CNC reciprocal saw.

34. A method for making a yieldable cushioning element as recited in claim 25, wherein each of said interlocking units have a uniform dimensions along said height and said length.

35. A yieldable cushioning element that includes foam, the cushioning element comprising:

foam formed to have a top, a bottom, and an outer periphery, said foam being compressible so that it will deform under the compressive force of a cushioned object,

a plurality of foam buckling members formed in said foam, each of said buckling members having a longitudinal axis along its length, and each of said buckling members a top end and a bottom end;

at least one of said ends of said foam buckling members being formed integral with one of said foam top or said foam bottom,

wherein the cushioning element is adapted to have a cushioned object placed in contact with said top;

wherein each of said buckling member ends is positioned at two different points of said buckling member axis;

wherein at least one of said buckling members is positioned within said foam such that said buckling member axis is positioned generally parallel to the direction of a compressive force exerted on the cushioning element by a cushioned object in contact with said foam; and

wherein at least one of said buckling members is capable of buckling beneath a protuberance that is located on the cushioned object.

36. A device as recited in claim 1 or 35 manufacturing according to a casting technique utilizing rise in place foam.